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VACCINIUM PROCESSING IN THE WASHINGTON CASCADES

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ABSTRACT.—Among the native peoples of south-central Washington, berries of the genus *Vaccinium* hold a significant place among traditional foods. In the past, berries were collected in quantity at higher elevations in the central Cascade Mountains and processed for storage. Berries were dried along a shallow trench using indirect heat from a smoldering log. To date, archaeological investigations in the Gifford Pinchot National Forest have resulted in the identification of 274 *Vaccinium* drying features at 38 sites along the crest of the Cascades. Analyses have included archaeobotanical sampling, radiocarbon dating, and identification of related features, incorporating ethnohistoric and ethnographic studies. Archaeological excavations have been conducted at one of the sites. Recent investigations indicate a correlation between high feature densities and specific plant communities in the mountain hemlock zone. The majority of the sites date from the historic period, but evidence of prehistoric use is also indicated.

Key words: berries, *Vaccinium*, Cascade Mountains, ethnohistory, archaeobotanical record.

RESUMEN.—Entre los indígenas del centro-sur de Washington, las bayas del género V*accinium* occupan un lugar significativo entre los alimentos tradicionales. En el pasado, estas bayas se recogían en grandes cantidades en las zonas elevadas del centro de las Montañas de las Cascadas y se procesaban para el almacenamiento. Las bayas se secaban a lo largo de una zanja usando calor indirecto producido por un tronco en ascuas. Hasta la fecha, las investigaciones arqueológicas en el Bosque Nacional de Gifford Pinchot han dado como resultado la identificación de 274 restos de secado de *Vaccinium* en 38 localidades a lo largo de la cresta de las Moñtanas de las Cascadas. Los análisis han incluido el muestreo archaeobotánico, datación por radiocarbono e identificación de restos relacionadas, incorporando estudios ethnohistóricos y ethnográficos. Se han llevado a cabo excavaciones arqueológicas en una de las localidades. Investigaciones recientes indican una correlación entre altas densidades de restos y las comunidades vegetales específicas en el piso de *Tsuga mertensiana*. La mayoría de las localidades datan del período histórico, pero también se indica evidencia de uso prehistórico.

RÉSUMÉ.—Parmi les indigènes de Washington sud-central, les baies du genre *Vaccinium* tiennent une place significative parmi les nourritures traditionnelles. Dans le passé, des baies ont été cueillies en quantité à de hautes altitudes dans les montagnes centrales de Cascade et transformées en vîvres. Des baies ont été séchées le long d'un fossé peu profound en utilisant la chaleur indirecte d'une bûche brûlante sans flamme. Jusqu'ici, les investigations archéologiques dans la Forêt Nationale de Gifford Pinchot ont eu comme conséquence l'identification de 274 dispositifs de séchage de *Vaccinium* à 38 sites le long de la crête des Cascades.

Les analyses mises en oeuvre ont compris le prélèvement archéobotanique, le radiocarbone datant, et l'identification des dispositifs relatifs, incorporant des études ethnohistoriques et ethnographiques. Des excavations archéologiques ont été conduites à un des sites. Les investigations récentes indiquent une corrélation entre les densités élevées de dispositif et les communautés spécifiques de plantes dans la zone de hemlock de montagne. La majorité des sites datent de la période historique, mais l'évidence d'une utilité préhistorique est également indiquée.

Berries of the genus *Vaccinium* hold an important place among traditional foods for Indian people in the Pacific Northwest. For Yakama and Warm Springs Indians of Washington and Oregon, huckleberries are considered one of the ritually important foods, honored along with roots, venison and salmon at a series of three "first foods" ceremonies held during the gathering season. The last of these ceremonies is held at the time the berries ripen in the mountains, usually between late July and early August. In historic times, Sahaptin and Chinookan-speaking groups from the mid-Columbia River area collected and dried berries at upland locations within what is now the Gifford Pinchot National Forest. Sahaptin-speaking bands identified as Klickitat, Yakama, Skinpah, Kamiltpah, Wyam, and Tenino, along with Chinookan-speaking bands such as Wishxam, Wasco, and Watlala, all gathered berries in this area, which is situated along the crest of the Cascade mountain range between Mt. Adams and the Columbia River (Figure 1).

The following is a discussion of recent archaeological research on the process of drying huckleberries, including results of surveys, excavation, and feature sampling. A review of ethnographic source material relating to huckleberry processing is included, along with information derived from field trips and interviews with contemporary Yakama elders. Considerations of chronology and the manner in which berry processing relates to the larger issue of resource intensification in the Cascades are also discussed.

ETHNOHISTORIC SOURCES

There are numerous references in ethnographic and historic literature to huckleberry collection and processing within what is now the Gifford Pinchot National Forest, ranging from internal Forest Service documents to published ethnographic reports (Table 1). Several of these are primary sources, including Henry Brewer's description of an 1845 trip to the Mt. Adams huckleberry fields (Mudge 1854), the 1853 journal of George McClellan, the 1878 journal of Francis Marion Streamer (Briley 1986), the ethnographic reports of George Gibbs (Gibbs 1855, 1877), and C. E. Rusk's description of a trip around Mt. Adams in 1890 (Rusk 1924). Secondary sources are numerous. See Table 1 for an annotated summary.

Forest Service documents include a 1910 fire report (Stabler 1910), a 1911 report on Forest resources (Wilcox 1911), and a 1938 recreation report (Langdon 1938). As early as 1928, Forest Service photographers were documenting traditional native practices in the Sawtooth Huckleberry Fields, a large traditional berry patch still used today. Ray Filloon, who worked as a Forest Guard there in the

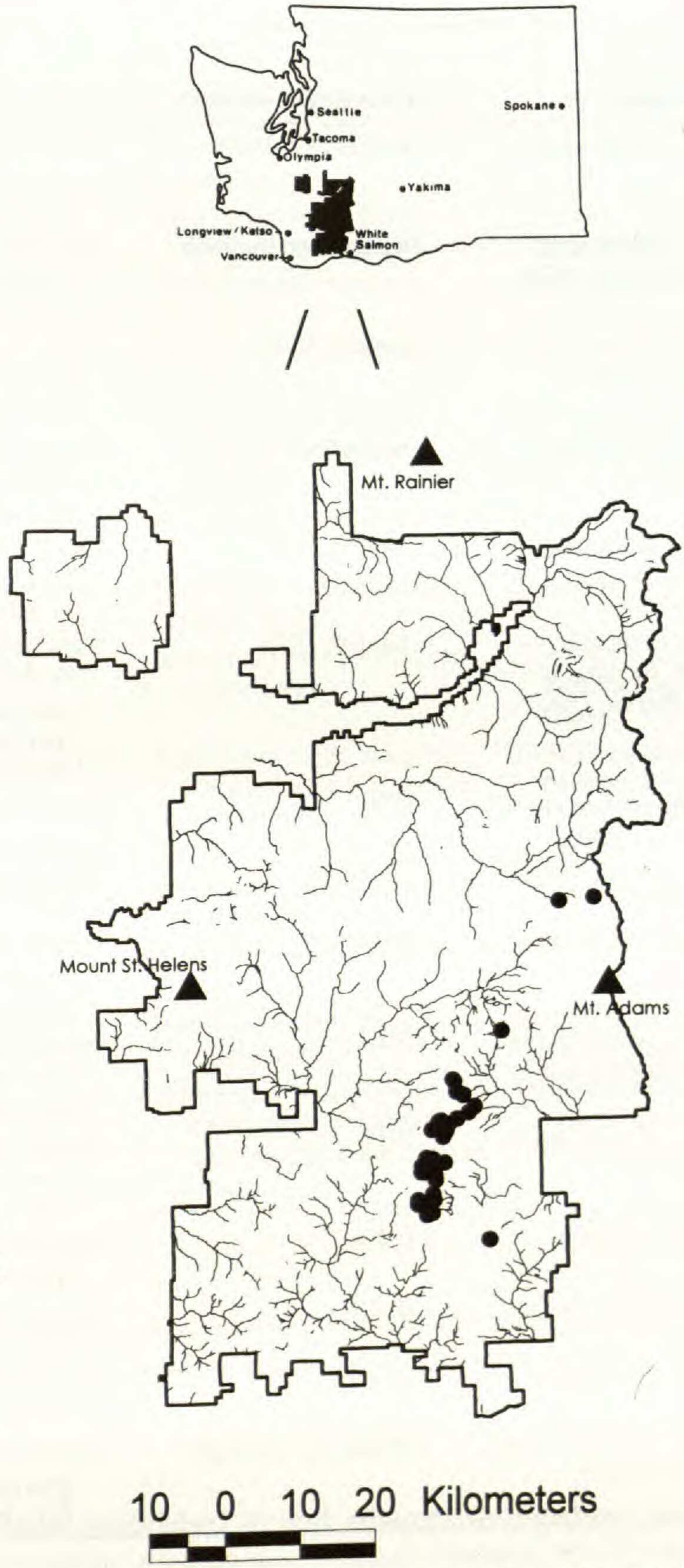

FIGURE 1.—Distribution of *Vaccinium* processing features, Gifford Pinchot National Forest, Washington.

TABLE 1.—Summary of ethnohistoric source data.

Ethnohistoric—primary observer	Date of observation	Observation
Henry Perkins—Methodist missionary (Boyd 1996)	August 19, 1843	Described length of stay at camps; quantity of dried berries collected
Henry Brewer—Methodist missionary (Mudge 1854)	September 15, 1845	Described berry camp; length of stay at camp; method of log fire drying
George B. McClellan—U.S. Army surveyor (1853)	August 1853	Described size of berry camp; associated activities (sweat lodge, wells)
George Gibbs—Ethnologist with McClellan party (1855, 1877)	August 1853	Noted huckleberries were dried and stored for winter use
Charles Olney—Yakama Indian (Hines 1992)	August 1869	Described variety in size and composition of berry camps
Francis Marion Streamer—traveled with Indians to berry fields (Briley 1986)	August 1878	Described length of stay at berry camps; size of camps; log fire drying method; quantity of berries collected
Claude E. Rusk—made circuit of Mt. Adams (1924)	1890	Described berry camp and drying of berries
Ellen Saluskin—Yakama Indian (Martin 1979)	1890s	Described method of log fire drying
Fred Plummer—USGS surveyor (1900)	1899	Noted that Indians purposefully burned to promote growth of berries
H. O. Stabler—Columbia National Forest Supervisor (1910)	1910	Noted that Indians caused fires by leaving drying log smoldering
Arthur Wilcox—Forest Assistant (1911)	1911	Noted that fires were often caused by berry drying logs
Eleanor Abraham (1963)	1920s	Described method of log fire drying
Louise Billy—Yakama Indian (1992, 1995)	1930s	Described method of log fire drying
Elsie Dick—Yakama Indian (1992, 1995)	1930s	Described method of log fire drying
Ray M. Filloon—Forest Guard, photographer (1952)	1930s	Described and photographed method of log fire drying

TABLE 1.—(continued)

Ethnohistoric—secondary source	Source of information	Information
Verne Ray (1936)	Interviews with Klickitat consultant	Listed berry camps in area
David French (1957, 1965)	Interviews with Warm Springs consultants	Described method of log fire drying
William Osborne (1953)	Ethnohistoric research	Described method of log fire drying
Mary Schlick (1994)	Interviews with Yakama consultants	Described preparing logs for use in drying
Eugene Hunn (1990)	Interviews with Warm Springs and Yakama consultants	Described camps and method of log fire drying
Norton, Boyd, and Hunn (1983)	Ethnohistoric research	Described camps and method of log fire drying
Click Relander (1959)	Interviews with Yakama consultants	Listed berry camps in area
Spier and Sapir (1930)	Interviews with Wishram consultants	Described storage of dried berries; use as item of trade
Edward Curtis (1911a, 1911b)	Interviews with Yakama, Klickitat and Chinookan consultants	Described storage of dried berries; linguistic distinction of dried and stored berries
George Murdock (1980)	Interviews with Tenino consultants	Described use of dried berries
Melville Jacobs (1934)	Interviews with Taidnapam consultant	Described drying berries
Helen Schuster (1975)	Interviews with Yakama consultants	Described method of log fire drying
Allan Smith (1964)	Interviews with Yakama, Taidnapam, Nisqually, and Muckleshoot consultants	Described alternative methods of drying berries, including log fire method

1930s, extensively photographed traditional methods of drying huckleberries, and later published his observations in an illustrated magazine article (Filloon 1952).

BERRY PICKING

Berry camps were established in and adjacent to meadows and fire-created openings in the mountains, usually near lakes or streams. Social composition and size of the camps varied, but camps typically consisted of one or more extended family groups. Published accounts range from descriptions of single family camps to large gatherings representing multiple bands (Streamer in Briley 1986; McClellan 1853; McWhorter in Hines 1992).

Several sources discuss the length of stay at huckleberry camps (Briley 1986:

61). On August 19, 1843, Methodist minister Henry Perkins wrote that the Indians at Wascopam (The Dalles) had moved to the mountains for berries:

> "They obtain at this season the large mountain huckleberry. The berry month is to the natives like one great holy-day. It always succeeds to the fishing months. . . . They are usually absent on these excursions, from four to six weeks; during which, each family lays in, for winter use, four or five pecks of nice dried berries." (Boyd 1996:275–276)

Methodist minister Henry Brewer accompanied Indians from The Dalles to the Mt. Adams fields in September of 1845. They left The Dalles on September 13. After arriving at their camp on September 15, 1845, Brewer wrote:

> "Here are a large company of Indians, busily engaged in picking whortleberries: these they dry by the fire, and preserve them for future use. They spend a month or more here, every season." (Mudge 1854:52–53)

Shelters used at these camps consisted of conical, tipi-like lodges with tule mat coverings over poles. In some cases wells were dug along the shores of lakes to provide a source of drinking water separate from that used by horses (McClellan 1853). Small sweat lodges were also erected (McClellan 1853; Briley 1986). Men often hunted deer, elk and bear while in the mountains, and sometimes traveled as far as 25 km from berry camps to obtain salmon for use in the camps. In the early 1900s there was an established trail leading from the Sawtooth Berry Fields to ***m'tuliash***, a fishing site at the Lower Falls on the Lewis River, a place where people continued to fish for salmon into the 1930s (Billy 1992). Black lichen (*Bryoria fremontii* Tuck.) was also gathered during the huckleberry season, as were whitebark pine nuts (*Pinus albicaulis* Engelm.).

Berry camps were dispersed throughout the upland berry patches, and berries were generally picked in the area surrounding the camp. However, pickers might venture as far as three kilometers from camp in search of berries, particularly on mountain slopes. Although at least four species of *Vaccinium* occur together in this area, the dark blue-black berries of *V. membranaceum* Dougl., or ***wiwnu*** in Sahaptin, were the focus of intensive harvest. Another species which was highly sought after, but which was only available at the highest elevations, was *V. deliciosum* Piper, or ***ililmuk*** in Sahaptin. The berries of *V. ovalifolium* Smith and *V. alaskaense* Howell are also common, but are less sweet and were apparently not sought after in quantity (Hunn 1990:178–179). However, women would often pick "blueberries" to mix in with huckleberries. The berries were picked and placed in coiled cedar root or folded cedar bark baskets tied around the waist (Figure 2). When full, these picking baskets were emptied into large baskets (2–5 gallons), supported by a tumpline or carrying strap across the shoulders. These large baskets were used to transport berries to camp as well as to drying locations.

THE ECONOMICS OF HUCKLEBERRIES

Historically, huckleberries were an important commodity for several reasons. For people who relied on stored foods for several months of the year, the relatively high vitamin C content of huckleberries was an important nutritional factor. A

FIGURE 2.—Yakama man picking huckleberries in the Sawtooth Berry Fields, Gifford Pinchot National Forest. August 1933 photograph by K. D. Swan, USDA Forest Service.

single cup of huckleberries provides nearly half the recommended dietary allowance (RDA) of vitamin C for an adult (Hilty 1972:16). Although the vitamin C content varies with season of harvest, storage conditions and species, it is notable that two studies found a higher vitamin C content in either stored or dried *Vaccinium* berries than in fresh (Benson et al. 1973:145; Keely 1980:42–43).

Huckleberries also functioned as an important item of trade. According to Spier and Sapir (1930:185), dried huckleberries were made into packages of standard size by the Wishram, and they attribute this standardization to a pattern of extensive trade. Francis Streamer makes reference in his 1878 journal to the fact that berries were being collected for local commerce, noting, "We have dried about 10 bushels of huckleberries and have a full supply on hand of fresh berries to sell at the Dalles" (Briley 1986:60–61). Ray Filloon, in his 1952 article "Huckleberry Pilgrimage," also describes how Indian women in the 1930s made cedar bark baskets, ". . . for transporting the berries from the patch to their homes or to towns, where they were sold house to house or traded at stores for food or other goods" (Filloon 1952:8).

A 1911 newspaper article entitled "At Indian Race Track" provides a succinct description of huckleberry economics:

> "They quickly pick their berries, take most of them to a fire-swept part of the mountain side, spread them on mats near a dead log, set it afire and with paddles stir the berries till thoroughly dried. The undried ber-

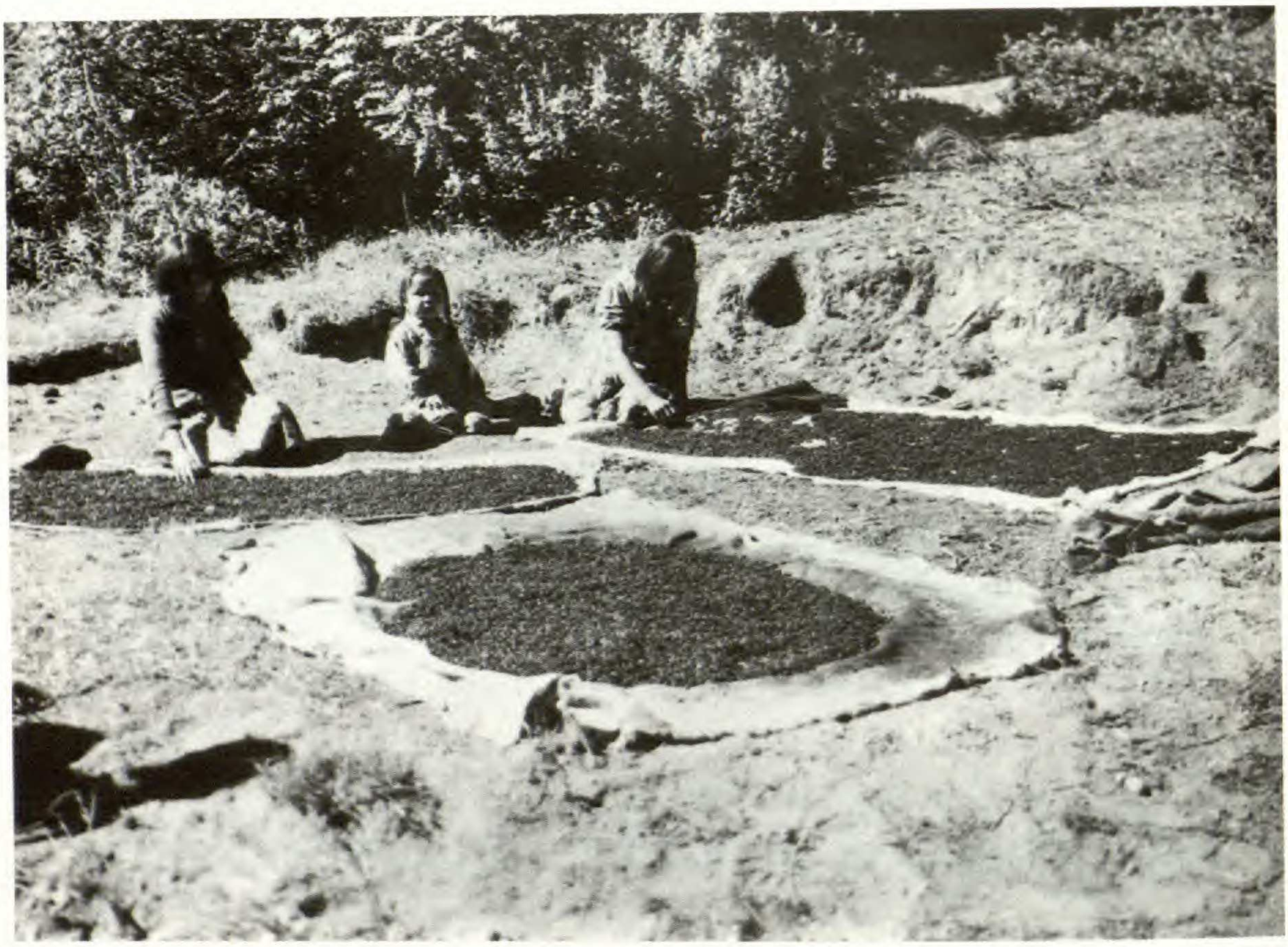

FIGURE 3.—Sun-drying huckleberries, August 1937. Photograph by Ray M. Filloon, USDA Forest Service.

ries are brought to town and sold for 50 cents to $1 per gallon." (Dunnicliff 1911)

In communities surrounding the Gifford Pinchot National Forest, huckleberries continue to function as a marketable commodity, and are sold by both Indians and non-Indians.

I-LA CIK WIWNU: DRYING THE BERRIES

Before 1935, the principal method of drying huckleberries in this area involved the use of reflected heat from a log fire. The following description of the drying process was derived partly from oral interviews conducted in 1992 and 1995 with two women who had assisted with drying huckleberries in this manner as children in the 1920s and early 1930s (Billy 1992, 1995; Dick 1992, 1995). This process has also been described by Abraham (1963), Filloon (1952), French (1965), Hunn (1990), Martin (1979), Norton et al. (1983), Osborne (1953), Schlick (1994), Schuster (1975), Stabler (1910), and Wilcox (1911).

A preliminary step in the drying process involved spreading the berries on mats in the sun for two or three days. Children were assigned the task of keeping birds and small animals away from the drying berries (Figure 3). The next step involved the selection of a suitable log, one that was sufficiently dry and decayed to maintain a smoldering fire. Trees near camp were sometimes felled for this purpose, or girdled in preparation for future use. Francis Marion Streamer de-

FIGURE 4.—Wáksaspam, a Yakama woman, drying huckleberries at Meadow Creek Indian Camp, August 1935. Photograph by Ray M. Filloon, USDA Forest Service.

scribed in his 1878 journal how he and Chief John felled a "large dry fir tree" to use as a drying log, which he said served two families (Briley 1986:59). In 1973 Wilson Charley recalled for Mary Schlick the felling of a large dead tree at Meadow Creek camp for his grandmother to use as a drying log (Schlick 1994:83). Another woman recalled how her uncle would debark standing trees at Meadow Creek camp to have them ready for future use as drying logs.[1]

After the log was selected, a trench approximately one meter wide was then excavated along one side of it, and a sloping mound of earth was built up along the edge of this trench, opposite the log. Beargrass (*Xerophyllum tenax* (Pursh.) Nutt.) was spread over the sloping face of the mound, and a tule mat laid lengthwise across it. A pole was sometimes laid across the base of the mound, and the lower edge of the tule mat was propped over the pole. Rocks were gathered and arranged in a single row along the base of the trench, preventing the mat from sliding forward. The rocks undoubtedly also served a secondary function as an aid in storing and reflecting heat. The mats might also be weighted down along the edges with rocks or poles.

Children were assigned the task of carrying water to the drying site, and of collecting the firewood needed to ignite the log. Water was needed to prevent the berries from being burned, in the event that the log burned too intensely. When all was ready, berries were spread over the mat and the log was ignited. To ensure that the berries dried evenly and did not burn, a woman would regularly stir the berries with a long, oar-like wooden paddle (Figures 4, 5). The width of the trench, approximately one meter, most likely reflected the optimal distance for the berries to be situated from the heat source. The process was usually initiated early in the day, and the berries would take six to eight hours to dry. The dried berries were

FIGURE 5.—Lena Waters Pinkham drying huckleberries, August 1937. Photograph by Ray M. Filloon, USDA Forest Service.

then packed into baskets and carried back to camp, where they might again be spread on mats in the sun to complete the drying process. When dried in this manner, berries would reportedly keep up to a year in storage. If enough of the log remained, it could be used again in subsequent years. Several consultants have stated that the drying log "belonged" to an individual, and would not be used by others.

THE ARCHAEOLOGY OF *VACCINIUM* PROCESSING

Prior to 1985, archaeological surveys on National Forest lands in the Pacific Northwest failed to recognize *Vaccinium* processing sites. Forest Service photographer Ray Filloon (1952:12–13) had, over thirty years earlier, described finding "... the all-but obliterated long ridges and trenches with rows of stones, where long ago the Indian women had dried their huckleberries. ..." In 1985 and 1986, archaeologists first documented trench features with "rows of stones" during reconnaissance in and near the Indian Heaven Wilderness, Gifford Pinchot National Forest. In following years, more sites were found through systematic archaeological surveys for wilderness trail reconstruction projects and timber sales outside the wilderness. Between 1995 and 1999, several archaeological surveys were conducted specifically to identify additional *Vaccinium* processing sites within and adjacent to the Indian Heaven Wilderness.

To date, a total of 274 *Vaccinium* processing features have been identified and documented at 38 sites within the Gifford Pinchot National Forest (Table 2). Most of the sites are located in or adjacent to the Indian Heaven Wilderness, along the crest of the Cascade Mountain Range between Mt. Adams and the Columbia River. Two sites occur in the upper Cispus River watershed, near the north side

FIGURE 6.—Berry processing paddle (***su-xaash***) from Meadow Creek Trail site (45SA424). Photograph by Cheryl A. Mack, USDA Forest Service, 1998.

of Mt. Adams. At least one site with similar features has been identified further north, within the Mt. Baker-Snoqualmie National Forest (Miss and Nelson 1995). All of these sites are characterized by the presence of linear drying trench features, visible on the surface. Criteria for identification include:

1. Trench—dimensions averaging 1 m in width, 6 m in length; and 20 cm in depth
2. A row of rocks, rarely fire-cracked, along base of trench (exposed or sub-surface)
3. Mound of soil parallel and adjacent to one side of the trench
4. Charcoal, usually in thin but dense layer along base of trench
5. Remains of log, charred or decayed, parallel to trench, opposite mound of soil

Although all features were detectable on the surface, probing with a trowel or tile probe was necessary to identify subsurface rocks and charcoal. Agnes Mark, Louise Billy, and Elsie Dick, Yakama elders personally familiar with their construction and use, confirmed functional identification of the trenches as *Vaccinium* processing features in the field.

The sites range in size from Big Meadow Camp (45SA338) at 96.3 ha with 65 features, to several sites represented by single trench features. Feature density within Big Meadow Camp averages 1 trench per 1.45 ha area, reflecting both the highly dispersed nature of features within sites, and the difficulty of defining site

boundaries. In addition to the trenches, a number of the sites also contain features associated with residential use. Surface artifacts associated with residential occupancy, berry collection and processing were also identified at many sites.

ASSOCIATED ARCHAEOLOGICAL FEATURES AND ARTIFACTS

Several of these sites contain a complex of associated features that demonstrate their function as residential camps. These features include tipi rings, sweat lodge remains, a roasting pit, culturally modified trees, cut stumps, wells, refuse dumps and other associated artifacts. Cached tipi poles were noted at one site, and linear horse race tracks were documented at two other sites. Refer to Table 2 for a summary of features and artifacts at each site.

In 1998, a carved wooden paddle (Figure 6) was recovered from the surface at site 45SA424. The weathered paddle, made of cedar, measures 2.76 m in length, with a 3-cm diameter shaft or handle. The paddle blade is 50 cm long and 7.5 cm wide. The proximal end tapers to a dull point, and is burned. Tribal representatives visited the site and identified the artifact as a ***su-xaash***, or berry processing paddle. The specimen from site 45SA424 is virtually identical to that used by Lena Waters in a 1935 Filloon photograph (Figure 5). The paddle was associated with a cluster of other artifacts, including a galvanized bucket and a white enamelware pot. These items had likely been cached in the limbs of an adjacent tree.

ENVIRONMENTAL CHARACTERISTICS

Distinct patterning is evident in the distribution of berry processing sites, both in terms of elevation and association with specific plant communities. Site elevations range from about 940 to 1550 meters. The majority of the 38 sites (76%) occur in the mountain hemlock vegetation zone, with a few (8%) found in the subalpine fir zone. A small number (16%), from lower elevations, lie within the Pacific silver fir zone.

We found that most of the berry processing features are closely associated with a single plant community. Seventy percent occur within a mountain hemlock/red heather-delicious blueberry (TSME/PHEM-VADE) association (Diaz et al. 1996). This plant community typically occupies high elevation parkland areas in the mountain hemlock zone, often as a mosaic of meadow and tree islands (Figure 7). Topography is generally flat to moderately sloping, including upland benches and areas adjacent to small lakes, ponds, or wet meadows. Both *Vaccinium deliciosum* and *V. membranaceum* are common within this plant community.

Berry processing sites at lower elevations are primarily associated with seral plant communities in Pacific silver fir forests, where *V. membranaceum* is common but *V. deliciosum* does not occur. Berry patches within this zone are transitional in nature, and succession can be quite rapid, ultimately reducing huckleberry productivity. In the mountain hemlock zone, where subalpine plant communities exhibit relative stability of species composition, berry patches may remain productive over a greater time span.

Indians in this area used fire as a tool to enhance huckleberry productivity, particularly at lower elevations. Plummer (1900), in an early report for the United

TABLE 2.—Inventory of *Vaccinium* processing sites in Gifford Pinchot National Forest.

State no.	Name	Elevation	Plant association	Number of processing features	Associated features and artifacts
45SA207	Tipi Pole Camp	1213 m	ABAM/VAME-XETE	8	tipi rings, sweat lodge, dump, trail, CMTs
45SA262	*SkIs-xaLia* (Little Huck Camp)	938 m	ABAM/VAME-XETE	8	tipi rings, tipi poles, CMTs
45SA263	Heart Lake	1402–1463 m	TSME/PHEM-VADE	16	trail
45SA265	*Kpss-wa-nite*	1182–1207 m	TSME/VAME-XETE	5	sweat lodge, lithics, CMTs
45SA289	Green Lake South	1305 m	TSME/PHEM-VADE	1	trail
45SA290	Red Mountain	1292 m	TSME/PHEM-VADE	2	none
45SA291	*Kalama't* (Racetrack)	1305 m	ABLA/XETE	3	tipi rings, sweat lodges, well, CMTs, artifacts
45SA292	Green Lake	1295 m	ABLA/XETE	23	tipi rings, sweat lodge, CMTs
45SA293	Berry Mountain	1305 m	TSME/PHEM-VADE	5	Racetrack Trail
45SA294	Indian Heaven Trail	1463 m	TSME/RHAL	4	trail
45SA295	Deep Lake	1548 m	TSME/RHAL	2	trail
45SA336	Naha Lake Camp	1451 m	TSME/PHEM-VADE	4	trail
45SA338	Big Meadow camp	1463 m	TSME/PHEM-VADE	65	tipi rings, sweat lodges, well, trail
45SA360	Hidden Lakes	1183 m	ABAM	2	old trail
45SA364	*IskIs Watum* (Surprise Lakes #1)	1295 m	TSME	1	well, dump
45SA365	Surprise Lakes #2	1295 m	TSME	3	wells, hearth
45SA375	Surprise Lakes #7	1295 m	TSME	2	none
45SA412	Tepee Camp	1231 m	TSME/VAME	11	sweat lodge
45SA413	Bird Mtn. Meadows	1530 m	TSME/PHEM-VADE	8	CMT
45SA414	Wood Lake	1542 m	TSME	2	old trail
45SA420	*Ayun-ash*	1180 m	ABAM/VAME-XETE	7	old Crest trail
45SA421	Sheep Lakes	1250 m	ABLA/XETE	1	none
45SA424	Meadow Creek Trail	1088 m	ABAM	4	roasting pit, paddle, CMT
45SA425	Triangle Meadows	1390 m	TSME/PHEM-VADE	16	tipi rings, sweat lodge
45SA426	West Umtux	1481 m	TSME/PHEM-VADE	10	trail

TABLE 2.—(continued)

State no.	Name	Elevation	Plant association	Number of processing features	Associated features and artifacts
45SA427	Linear	1377 m	TSME/PHEM-VADE	16	circular depressions
45SA428	S. Gifford Way	1463 m	TSME/PHEM-VADE	7	trail
45SA429	Lemei Lake	1487 m	TSME/PHEM-VADE	2	trail
45SA430	Junction Lake	1445 m	TSME/PHEM-VADE	8	trail, lithics
45SA431	Cultus Campground	1218 m	TSME/VAME-XETE	1	lithics
45SA432	Surprise Crest	1289 m	TSME	1	trail
45SA433	Tombstone Lake	1390 m	TSME/PHEM-VADE	3	trail
45SA434	Adi Lake	1378 m	TSME/PHEM-VADE	4	trail
45SA435	Muddy Meadows	1341 m	TSME	1	trail
45SA436	Swampy Meadows	1198 m	TSME	5	none
45SA437	Swampy Meadows #2	1195 m	TSME	1	none
45SA446	Cultus Creek	1103 m	ABAM/VAME-XETE	11	trail, CMTs, artifacts
45SA447	Cultus Lake	1554 m	TSME/PHEM-VADE	1	trail
			Total:	**274**	

(38 Total Sites)

ABAM: *Abies amabalis;* ABLA: *Abies lasiocarpa;* PHEM: *Phyllodoce empetriformis;* RHAL: *Rhododendron albiflorum;* TSME: *Tsuga mertensiana;* VADE: *Vaccinium deliciosum;* VAME: *Vaccinium membranaceum;* XETE: *Xerophyllum tenax;* CMT: Culturally modified tree.

FIGURE 7.—*Tsuga mertensiana/Phyllodoce empetriformis/Vaccinium deliciosum* plant community at Big Meadow Camp (45SA338). Photograph by Cheryl A. Mack, USDA Forest Service, 1992.

States Geological Survey, described the various causes of fires on what is now the Gifford Pinchot National Forest. He wrote that Indians started fires to, among other things, promote the growth of huckleberries (1900:135). Forest Service Fire Reports for the years 1904 and 1905 attribute half of the fires on the forest to intentional burning by Indians (Allen 1904, 1905). These fires occurred in or adjacent to existing huckleberry patches, removing predominantly immature trees.

It is likely that our current understanding of site distribution is influenced by sampling bias, as well as differences in site discoverability. Berry processing sites are more visible and hence easier to find at higher elevations, where tree growth is very slow. But slower regrowth also means that berry patches last longer at high elevations, and therefore we would expect more extensive evidence of use. Aside from a stated cultural preference for its sweetness, *V. deliciosum* may also have been suitable for picking later in the season, due to its frost tolerance. Because it is adapted to harsher environments than *V. membranaceum,* it may also have been available in years when the *V. membranaceum* crop failed. It is also possible that these mountain hemlock/subalpine meadow plant communities were generally a more predictable source of huckleberries over time, providing a level of resource reliability not possible with transitory, fire-created patches (Mack and McClure 1996). The feasibility of logistically-organized intensive huckleberry production was obviously dependent upon such predictable resource quantities.

FIGURE 8.—Feature 13, *Vaccinium* processing feature, Big Meadow Camp (45SA338). Photograph by Richard H. McClure, USDA Forest Service, 1995.

FEATURE STRUCTURE: EXCAVATIONS AT BIG MEADOW CAMP (45SA338)

To better understand the archaeology of *Vaccinium* processing, excavation of a representative drying trench feature was conducted in 1995. Under the auspices of the Forest Service *Passport in Time* public archaeology program, a crew of trained volunteers assisted in the detailed investigation of one of 65 features at Big Meadow Camp (45SA338), in the heart of the Indian Heaven Wilderness. Feature 13 was selected for its average size and appearance, and because it lacked surface evidence of an associated log, suggesting possible prehistoric age. One of our research goals was to obtain samples suitable for radiocarbon dating. Also, by completely exposing the feature, we hoped to provide a comparison between surface and subsurface characteristics.

A grid was imposed over the feature, and surface vegetation removed. The sod layer, largely a mass of rootlets from surface vegetation, was peeled back, exposing the original charcoal-stained surface of the feature and associated rocks (Figure 8). Surface mapping involved plotting exposed rocks and collecting elevation measurements. Mapping data were later digitized in an AutoCAD program for plotting as a contour map (Figure 9). When mapping was complete, a 1-m × 2-m trench was excavated to bisect the north end of the feature and provide a cross-section profile (Figure 10). Sediments removed from the trench were initially screened through 3-mm mesh to isolate any associated artifact material. Excavations were arbitrarily terminated at a depth of 50 cm below datum, approximately 40 cm below ground surface.

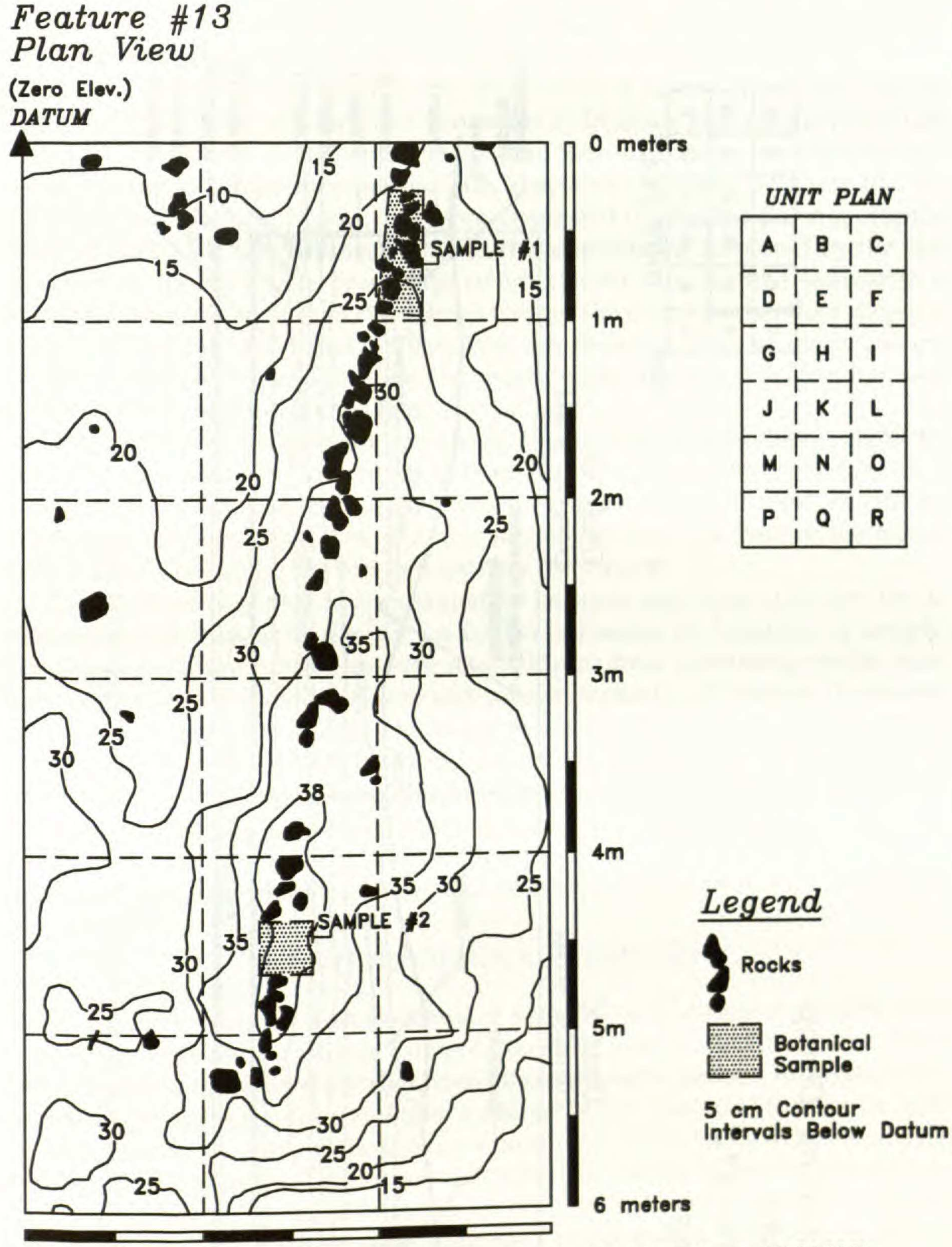

FIGURE 9.—Plan view contour map of Feature 13, Big Meadow Camp (45SA338).

In cross-section, Feature 13 is a depression, 14 cm to 18 cm in depth and 1.8 m wide, with rocks positioned at its base. A dense but thin layer of charcoal, 2 cm to 4 cm in thickness (Stratum II), lies at the base of the trench, east of the rocks. As seen in the profile, charcoal is concentrated on the side of the trench opposite the low mound of soil that parallels the trench. The log which served as the heat

Big Meadow Camp
45SA338
Feature #13
Profiles

UNIT PLAN

Unit C
South Wall

Unit B
South Wall

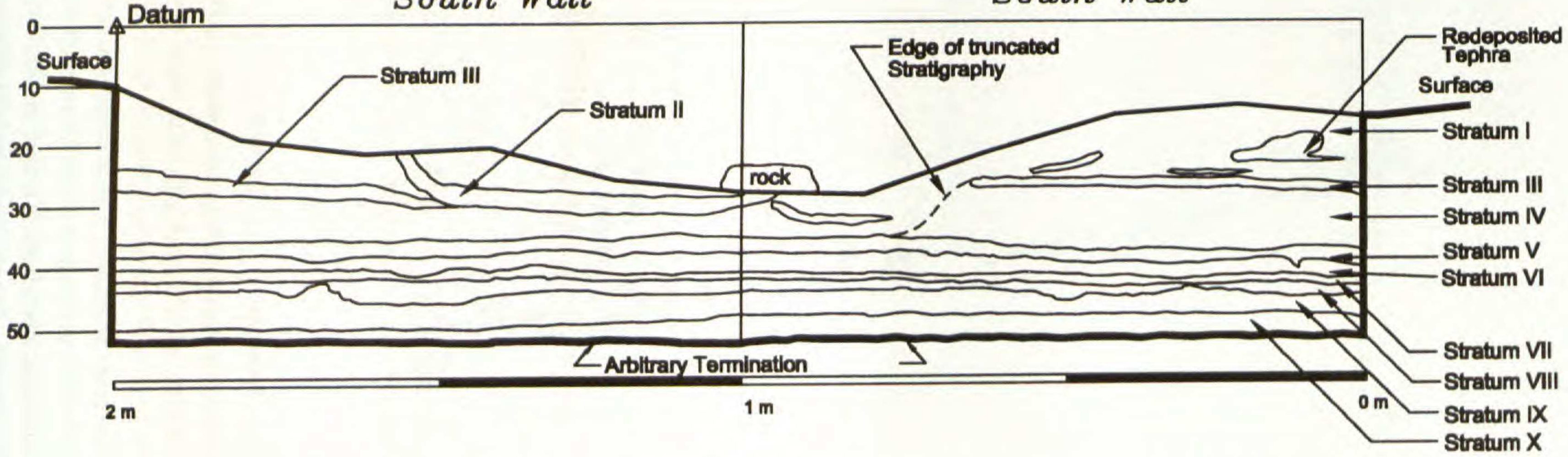

FIGURE 10.—Stratigraphic cross-section profile, Feature 13, Big Meadow Camp (45SA338).

source would have been located here, and presumably the charcoal originated from either the burned log, or from the fuel material used to ignite the log.

The stratigraphic profile includes three distinct layers of volcanic tephra. Tephra samples were collected and submitted to Dr. Nick Foit, Geochemical Laboratory, Department of Geology, Washington State University, for identification using electron microprobe analysis. The uppermost of these (Stratum III) was identified as Mount St. Helens *We* tephra, deposited during the Kalama eruptive event of A.D. 1482 (Mullineaux 1996:73). This deposit was truncated by the construction of the *Vaccinium* processing trench (Figure 10). Mottled sediments of Stratum I, near the surface of the mound west of the trench, result from displacement and mixing of the tephra. Two thin ash deposits from an older volcanic eruption (Stratum VII and Stratum IX) occur deeper in the soil profile, but were undisturbed by trench construction.

The excavation of Feature 13 provided a great deal of information about the archaeological signature of berry processing activity. In most respects, Feature 13 was average in size and appearance, and it contained over 70 rocks of cultural origin. The majority were arranged in a single line down the base of the trench, with a few found along the top and sides of the mound.

Three matrix samples of approximately 1.4 liters each were collected for archaeobotanical analysis during the excavation of Feature 13. Locations of samples are shown in Figure 9. Samples were selected from areas containing visible quantities of charcoal and oxidized soil, and consist primarily of Stratum II material. The samples were analyzed by Dr. Nancy Stenholm, Botana Labs, Seattle, Washington and results provided in a letter report (Stenholm 1995). Charred conifer needles from one of the samples produced an AMS radiocarbon date of 70 $\pm$ 40 B.P. Mature seeds of plantain (*Plantago lanceolata* L.), an alien species, were also identified in the sample, suggesting an historic period age for the feature. Results of sample analysis, discussed below, also provide evidence of feature function.

ARCHAEOBOTANICAL SAMPLING

A series of fourteen archaeobotanical samples were collected in 1990 from nine trench features at Tipi Pole Camp, Little Huck Camp, and Heart Lake (Mack 1992). These samples were derived from 10-cm diameter probes. At several sites, samples were collected from multiple locations within the same feature, in order to determine which part of the feature would most likely yield archaeobotanical remains. Four control samples were also collected outside of trench features. An additional six samples were collected in 1995, from Features 13 and 14 at Big Meadow Camp. All samples were submitted to Dr. Nancy Stenholm of Botana Labs, Seattle, Washington, for archaeobotanical analysis (Stenholm 1990, 1995).

Charred fruits, seeds and tissue of *Vaccinium* were recovered from seven of these samples. It is notable that of the fourteen samples collected from probes in 1990, only two produced charred *Vaccinium* remains, in contrast to five of the six samples collected in 1995. The visibility provided during exposure and excavation of Feature 13 clearly revealed the extent and location of burned material within the feature, and samples were collected to optimize recovery of botanical remains. The samples collected from probes in 1990 were collected from a variety of lo-

cations within the features, since it was not apparent from the surface of the feature where burned material was concentrated.

Size and appearance of carbonized fruits suggest either *Vaccinium deliciosum* or *V. membranaceum,* fully ripe at burning. This would indicate processing in mid-dle to late summer. Nearly entire fruits were recovered in samples from 45SA207, 45SA263, and 45SA338. Samples also contained a shiny amorphous black material with bubble or steam cavities identified as processed edible tissue (PET). Stenholm (1995) defines this as "tissue which resembles sugar-laden fruit or berry tissue without the seeds."

Archaeobotanical samples also included charred fragments of worked wood, including possible tool fragments. Samples from sites 45SA207 and 45SA263 in-clude small plank or board fragments. One of the samples from 45SA207 also produced the fragmentary end of a small pole, 2 cm in diameter, with probable cut marks. Samples from 45SA263 included a fragment of a flattened or spatulate object with a worn knife-like end, the worn tip of a wood implement, and two flattened or tabular items with worn convex ends. A charred fragment of a worn tool tip was also recovered from a Feature 14 sample. The tiny fragment of cedar or hemlock may have been part of a skewer or slat.

Three bulrush seeds were also recovered from Feature 14 samples, most likely representing the species *Scirpus validus* Vahl. The stems of various species of bul-rush, referred to locally as tule, were used for making the mats on which the berries were spread to dry. Although *S. validus* is not often mentioned as an eco-nomically important species (Stenholm 1995:7), it is the species that grows in Trout Lake, an area identified by local Indian people as a place where tules were collected while traveling to the berry camps (Billy 1992, 1995).

Comparison of the 1990 samples with those collected in 1995 at Big Meadow Camp indicate significant differences in tree species composition among the sam-pled sites. Botanical assemblages from lower elevation berry processing sites con-tain high percentages of early seral species, such as Douglas-fir (*Pseudotsuga men-ziesii* (Mirbel) Franco) and willow (*Salix* spp.), as fuelwood. Floral composition at most of these sites today is quite different, with climax populations of Pacific silver fir (*Abies amabilis* (Dougl.) Forbes) as the dominant tree type. Species rep-resented in the samples from the higher elevation site of Big Meadow Camp, primarily mountain hemlock (*Tsuga mertensiana* (Raf.) Sarg.), are the same as found on-site today. These differences suggest that fire-induced succession, whether natural or caused by humans, had a greater impact on species compo-sition at the lower elevation sites. Species composition in high elevation commu-nities is more constant.

SITE CHRONOLOGY

These sites have been dated with the help of ethnohistoric sources, tree-ring dating, and radiocarbon dating. Historic references provide dates of use for a num-ber of sites with archaeological features. One example comes from the 1853 journals of the McClellan expedition, which included ethnographer George Gibbs. McClel-lan and his survey party camped with 138 Klickitat Indians at a site called ***Che-quoss*** in August of 1853. The Indian camp of ***Chequoss*** most likely corresponds to

the site recorded as Green Lake (45SA292). According to Gibbs, the Indians at ***Chequoss*** were occupied in "feasting on strawberries and the mountain whortleberry" (1855:404). Whortleberry is another name applied to the huckleberry.

Use of several archaeological sites occurred within the living memory of tribal elders consulted as a part of our research. Based on their accounts, we know that ***SkIs-xaLia*** (45SA262) and ***Ayun-ash*** (45SA420) were still used in the 1920s and 1930s. *Vaccinium* processing features identified at ***Kpss-wa-nite*** (45SA265) and ***IskIs Watum*** (45SA364, 45SA365, 45SA375) may correspond to those photographed in use between 1933 and 1935.

Ethnographic research has established a link between huckleberry processing sites and another site type which is directly dateable through tree-ring counting. Numerous accounts describe how the bark of cedar trees was removed to make folded bark baskets, used to hold the surplus harvest of berries. Schlick (1994) describes these bark containers as expediency baskets, manufactured as needed in order to bring home the surplus harvest of berries. Lieutenant Johnson Kelly Duncan, topographer for the McClellan expedition in 1853, painted a watercolor miniature of two folded bark baskets, while camped at ***Chequoss,*** labeled "Cedar Bark Baskets—Klick-a-tat." Trees from which the bark was removed exhibit a characteristic scar. We have documented over 6,000 peeled cedar trees in the Forest, all with tool marks resulting from purposeful bark removal. The majority of these trees cluster along the periphery of historic huckleberry patches. Bark peeling dates from these cedars corroborate dates of occupation of nearby ethnographically-documented sites.

The site of ***Kalama't*** (45SA291) provides a good example, although there are numerous others. ***Kalama't,*** known today as the Indian Race Track, was a summer berry camp used by mid-Columbia River Indians. Use of the ***Kalama't*** area as a huckleberry patch has been documented archaeologically, through ethnographic and historic sources, and through the recollections of living Indian people. The site is included in Verne Ray's 1936 inventory of Klickitat villages and camps, where it is referred to as a summer camp and racetrack, in use in the period after 1850 (Ray 1936:149). Numerous historical features have been documented at the site, including a linear racetrack, tipi rings, sweat lodge remains, and the remains of huckleberry drying trenches. Internal Forest Service records as well as articles from local newspapers indicate that use of ***Kalama't*** was at a peak in the period between 1890 and 1910. Over 400 peeled cedar trees have been documented within 5 km of ***Kalama't***. Peeling dates recorded at these sites range from A.D. 1852 to 1950, with a peak in use between 1890 and 1910 (Mack 1996:35).

Analysis of peeling dates from cedar trees to the south of Red Mountain has helped to pinpoint the period of use of another, older berryfield in that area. The site of ***Chequoss*** was the place where Captain McClellan camped with 138 Klickitat Indians in August of 1853. Peeling dates from three peeled cedar sites, containing 323 trees, located to the south of ***Chequoss*** indicate use of that area from A.D. 1804 to 1911, with a peak in use in the decade after 1850. After 1890 the site appears to have been rather abruptly abandoned, perhaps due to declining huckleberry yields.

We have collected a total of 235 tree ring dates from peeled cedars, ranging from A.D. 1720 to 1950. It is probably our best tool for determining the age of

adjacent berry processing sites used within the last 300 years. Based on an analysis of the range of peeling dates at a number of sites, it appears that the average duration of use of a huckleberry patch was between 40 and 70 years. This would have varied based on the size of the huckleberry patch, with larger patches remaining productive over a longer time period.

We know that if huckleberry patches are created and maintained by fire, they eventually revert back to forest when fires no longer occur. A few of the sites that we have recorded are situated within mature forests. These sites were most likely initially occupied following a forest fire event, which destroyed the forest cover and provided productive, though temporary, huckleberry habitat. Overstory trees present at these sites today most likely became established during the time the sites were in use as huckleberry camps, and their subsequent growth would ultimately have led to site abandonment, when shade resulted in declining huckleberry yields. For those sites in forested settings, it is possible to determine the overall age of the trees growing on the site through tree ring counting, using an increment bore. If the assumption that the current overstory trees began growing during the latter part of the period of site use is correct, then the age of these trees should give an indication of the age of the site. The range of tree ring counts at the Swampy Meadows site indicated the existing overstory trees began growing at the site between A.D. 1816 and 1860. We then compared these dates to the peeling dates from the closest peeled cedar site to Swampy Meadows, and found the range of peeling dates there indicated use between A.D. 1816 and 1847.

Thirteen charcoal samples were collected from individual trench features at five sites and submitted for dating. Resulting age determinations range from 600 ± 50 years B.P. to 100 ± 80, with two samples reported as "modern" (Mack 1992: 12). The three oldest dates are from Tipi Pole Camp (45SA207), a site that was in use in 1910. In considering these results, we realized that some of the wood charcoal samples submitted for dating could represent "old wood"—very old slow-growing trees that stood as snags for some time before utilization in *Vaccinium* processing. Because of this "old wood effect," we do not believe the earlier dates provide reliable age determinations for berry processing events.

To obtain age determinations that more accurately reflect the *Vaccinium* processing activities, we subsequently submitted samples consisting of charred needle fragments from Feature 13 and Feature 14 at Big Meadow Camp (45SA338). Presumably, the needles represent fuel material used to ignite a downed log. Based on the lack of ethnohistoric data specific to this site, an absence of associated historic artifact material, and the almost completely deteriorated condition of the drying logs, we felt that both features might be of prehistoric age. The samples produced AMS dates of 70 ± 40 B.P. and 350 ± 40 B.P., indicating both prehistoric and historic period use of this site. A charred *Vaccinium* fruit recovered in the archaeobotanical sample from Feature E-1 at the Heart Lake site (45SA263) was also submitted for AMS dating. The berry tissue produced a date of 150 ± 50 B.P.

DISCUSSION

Aside from providing insight into one resource procurement activity, research into the age of these features has important bearing on our understanding of

changing land use patterns in the late prehistoric period. Huckleberries are notable in that they were available in quantities suitable for collection as a stored food, and they could be dried to a raisin-like consistency and stored over the winter. The ability of late prehistoric Columbia River peoples to remain in semi-permanent villages was dependent on their ability to accumulate stored resources for winter use. For people who lived almost a third of the year on stored foods, dried huckleberries provided an important wintertime source of vitamin C.

Some researchers have suggested that intensive huckleberry collection and processing is directly related to equestrianism (Schalk and Atwell 1994, in Burtchard 1997). The argument used by Schalk and Atwell, namely that it was not feasible to transport huckleberries in bulk from the uplands prior to the introduction of the horse, is weak, given that the technology for transport existed, as evidenced by tumplines used to carry larger pack baskets across the back (Figure 2). Additionally, the archaeological record points to an intensification of root gathering and processing in the uplands of the region ca. 500 B.C.–A.D. 1000 (Chatters and Pokotylo 1998:78), long before the arrival of the horse. A discussion of alternative means of transporting food in the pre-horse era, such as the use of dogs, is beyond the scope of this paper, although linguistic and ethnographic data from the Plateau suggests that dogs functioned as beasts of burden in the pre-horse era (Kennedy and Bouchard 1998:244; Stern 1998:397).

Establishing the time depth of this activity is important, since this bears directly on the question of whether intensive processing of huckleberries is related to equestrianism or resource intensification. The results of our dating efforts indicate that bulk processing of huckleberries does pre-date the introduction of the horse in this area. Most researchers agree that resource intensification strategies increased during the late prehistoric period in response to increasing population density (Burtchard 1990, 1997). Berry drying features provide clear evidence for bulk processing of a seasonally abundant commodity. In the Northwest, the shift from a generalized foraging adaptation to a more logistically organized system, with seasonally occupied specialized sites, began some time in the mid-Holocene, ca. 5000 to 3000 years B.P. (Ames and Marshall 1980; Schalk 1980; Schalk and Cleveland 1983; Chatters 1989; Burtchard 1990). Intensive processing of huckleberries might well represent one component of the regional trend in resource intensification.

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NOTES

[1] Mamie Smith, Yakama Indian Nation, conversation April 11, 1995.

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